

*Batchelder (J. P.)*

**MEMOIR**

ON THE

**FRACTURE OF THE LOWER EXTREMITY**

OF THE

**RADIUS.**

*Presented by  
A. E. M. Purdy*

**BY JOHN P. BATCHELDER, M. D.**

*Professor of the principles & practice of Surgery in the  
BERKSHIRE MEDICAL INSTITUTION.*

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## MEMOIR &c.

FROM the frequency of this species of fracture, and the deformed and crippled state of the limb which so invariably follows all the common modes of treating it; and from the conviction that its precise nature and method of cure are not well understood, I am induced once more to invite the profession to a farther consideration of the subject.\* The bones of the wrist are articulated with the radius only; which has been figuratively styled the handle of the hand, because whether flexed or extended at the elbow or turned upon its own axis, it carries that organ with it and regulates all its movements. The fracture here treated of is within an inch and a half or two inches of the lower extremity of the bone, and is generally caused by putting out the hand to save the body in case of a fall or to prevent that accident.

When the bone is fractured at that place, the supinator longus, the extensor carpi radialis, longior and brevior, and the three extensors of the thumb all unite in turning the hand upward and outward.† The inferior portion of the lower fragment, the carpus, and the ends of the metacarpal bones, following the hand in this movement, cause a swelling below the injury, on the outside of the arm and wrist, which might be, and almost always is, mistaken for a dislocation of the wrist backward and the depression on the inside opposite the carpus, tends to confirm the practitioner in this mistake. The pronator radii teres and quadratus, draw the fragments, at the fracture *inward* and towards the ulna: and, by pressing the flexor tendons still further inward or forward cause a swelling, which extends from the place of fracture about an inch and a half up and down the arm. Opposite this swelling on the outside of the radius is a considerable depression. While the hand is drawn upward and outward, as before described, the inferior extremity of the ulna seems to fall down in an opposite direction, and generally is quite moveable. It is impossible for the patient to perform the motions of supination and pronation by the muscles alone. The reason for this will be presently assigned. A late writer on this accident has informed us that if the surgeon lock his hand in that of the patient, and make extension, the arm immediately re-

\* The substance of this memoir was published many years ago in the New England Journal of Medicine and Surgery.

† I do not mean to use outward and inward in the common anatomical sense. When I use the former I wish to be understood as meaning that side of the arm, on which the extensor muscles lie, corresponding to the back of the hand;—when the latter, I mean the side of the arm upon which the flexor muscles lie.

sumes its natural shape, and that the fractured ends of the bone may be made to move at the place of the fracture by moving the patient's hand backward and forward; and if the surgeon apply the fingers of his other hand to the place of the fracture, he will be sensible of the motion of the fragments. This, I believe, is invariably true. A crepitus is seldom perceived, if it be, it is in consequence of the management of the surgeon just mentioned. In the sound state of these parts the pronator radii quadratus antagonizes the supinator longus, and the radial extensors of the wrist and thumb, which act in some degree as supinators; but when the radius is broken, the first named muscle co-operates with those in displacing the fragments, and its effect is greatly increased by the falling down of the ulna, as described above, because the quadratus arises from that bone and runs directly across to the radius into which it is inserted. Here, also, we find an explanation of the patient's inability to perform the rotatory motions.

I come now to the method of treating this accident. After some failures in treating this injury I was led from considering the anatomical structure of the arm to adopt the following method which has been, during many years extensive practice, attended with the most perfect success in every instance.

After making extension and counter-extension, and adapting the parts to each other, if the extension have not brought them in apposition, a compress extending from near the bend of the arm to the wrist, should be applied along the inside of the arm, and a similar one on the outside.

Against the radius at the place of the fracture the thickness of the inner compress must be considerably increased. In addition to the long compress on the outside, another should be applied transversely against the lower end of the radius and carpus, which project outward or backward, and make the swelling, spoken of in the first part of this paper. Over these compresses apply two splints, extending from the elbow to the ends of the fingers, and confine the whole with a roller wound with tolerable firmness, from the elbow to the lower end of the ulna and no further. In this, as in all other fractures of the bones of the forearm, the splints should be somewhat wider than the arm, to prevent the pressure of the roller forcing the fractured extremities of the bones together; for they will all firmly unite and the patient will have, literally, but one bone in the forearm, and consequently, be deprived of all power of rotating the hand; an occurrence which too frequently happens from neglecting the precaution suggested.

The pressure of the splints upon the compresses, forces the flesh into the space between the bones, and by counteracting the *pronator radii teres*, hinders the upper fragment from approaching the ulna, it also counteracts most of the other displacing causes; as well as prevents all lateral motion. In counteracting the quadratus muscle, we must not lose sight of the shape of the lower end of the ulna and radius, nor of the manner in which they are joined, nor for-

get that the point of articulation between them must be the fulcrum; and, that that portion of the radius, which is below the fracture, and into which the quadratus is inserted, is the lever, and the carpus and hand the weight raised by the quadratus, acting upon a lever of the first kind, and by the supinator longus, and extensors co-operating to produce the same effect. If we reverse the position and take off the agency of the extensors of the thumb, the radial extensors of the wrist, and the supinator longus, by our splints and compresses, the weight of the hand will be quite sufficient to counteract the quadratus muscle, and we can readily avail ourselves of this power, by placing the arm in a sling, in a state midway between supination and pronation, allowing the hand to hang down over the end of the ulna, the roller having been carried as before advised, no farther downward than the extremity of that bone. In about twenty days motions of flexion and extension, supination and pronation, should be impressed upon the limb by an assistant for half an hour twice a day. At first they should be gentle, and increased daily until the patient can perform all the motions with perfect ease.

P. S. The objects which the surgeon has in view in the treatment of this accident, are 1st. Coaptation of the fractured extremities—effected, generally, by simple extension, and counter extension. 2d. To keep the ulna and radius apart as much as possible—by the long compresses and splints, forcing the muscles into the interosseous space. 3d. To prevent all lateral motion of the fragments and hand—by the splints, which should be long enough to control that movement of the hand. 4. To counteract the quadratus muscle—by the weight of the hand hanging down over the end of the ulna.

To the students attending my Lectures, the foregoing Memoir is respectfully inscribed.

J. P. B.